Preface

Profound social and economic changes have taken place since the first group of NACME Scholars began their careers in the late 1970s. Diversity in the work force is today a strategic national advantage. The papers in this issue, taken from recently published journals, reflect the many contributions by NACME Scholars to one important sector—research—over a wide range of fields.

In their paper, Acoff and Thompson describe a study of constitutional liquid film migration (CLFM) in a corrosion-resistant nickel alloy. The paper provides the first extensive characterization of a grain boundary phenomenon that occurs in the heat-affected zone of multicomponent alloy systems.

The paper by Alexander, Reeves, and Gloster pertains to techniques and algorithms for developing parallel computer architectures. The authors show that a certain kind of parallel architecture promises to be particularly effective for handling digital signal and image processing applications.

In the next paper, Carter, Pines, and Rudd investigate fuel-optimal periodic flight maneuvers to achieve global reach (half the circumference of the earth) for a class of transatmospheric hypersonic flight vehicles—with the goal of exploiting the aerodynamic characteristics of hypersonic waveriders and scramjet propulsion to achieve global reach. The approximate analysis developed in their paper suggests that flying vehicles along periodic hypersonic cruise trajectories may result in two important performance gains at high speed: reduced fuel consumption and reduced integral heat load.

Next, Drayton, Henderson, and Katehi describe the use of silicon micromachining to create electronic circuit packages that reduce crosstalk in high-speed electronics systems. Their goal was to investigate a method to reduce electromagnetic interactions between interconnections used at microwave frequencies. The low coupling results of their micromachined packaged approach suggest a methodology for minimizing crosstalk between neighboring planar interconnections and also a means for developing truly three-dimensional high-density interconnections.

Hernández and Arkun examine the stability of nonlinear input/output models and of their inverses, extending their previous control theory analyses to a region specified around a particular equilibrium point. Their new analyses result in conditions for a dynamical system that retain it in the specified region and ensure that its equilibria in that region are asymptotically stable.

Jones and Celi focus on the creation of state-space models of rotorcraft flight dynamics for use in the analysis, design, and simulation of helicopters. They develop a frequency response sensitivity function that is applied to the determination of a coupled rotor-fuselage helicopter flight dynamics model.

McCauley Bell and Crumpton describe a method that may be useful in predicting the development of carpal tunnel syndrome. The method combines information on various risk factors (i.e., personal, occupational, and environmental) known to contribute to the onset of carpal tunnel syndrome. Predicted results from the model are confirmed using clinical examinations and electromyography testing.

Nyberg, Balcarcel, Follstad, Stephanopoulos, and Wang investigate the relationship between carbon metabolism, intracellular nucleotide sugar levels, and the glycosylation of gamma-interferon, a therapeutic protein produced by a Chinese hamster ovary cell line. They find that at varying degrees of glucose and glutamine limitations within continuous cultures, glycosylation varies only modestly despite greater variations in metabolism and intracellular nucleotide sugar pools. While nutrient limitation and the associated shifts in metabolism and intracellular nucleotide sugar pools correlate well with decreased glycosylation, their results prompt speculation of other cellular mechanisms that may also affect the glycosylation of recombinant proteins.

As Guest Editor of this issue of the *IBM Journal of Research and Development*, I am particularly pleased to have had the opportunity to participate in this small measure of recognition of fellow minority engineers.

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Guest Editor